

WHAT IS CLAIMED IS:

1. A method of detecting and locating noise sources each emitting respective signals  $S_j$  where  $j = 1$  to  $M$ , detection being provided by means of acoustic wave or vibration

5 sensors each delivering a respective time-varying electrical signal  $s_i$  with  $i$  varying from 1 to  $N$ , the method consisting:

· in taking the time-varying electrical signals delivered by the sensors, each signal  $s_i(t)$  delivered by a sensor being the sum of the signals  $S_j$  emitted by the noise sources;

· in amplifying and filtering the taken time-varying electrical signals;

· in digitizing the electrical signals;

15 · in calculating the functional

$$f(\mathbf{n}_1, \dots, \mathbf{n}_j, \dots, \mathbf{n}_N) = \sum_{k \neq 1} R_{kl}$$

with the coefficients  $R_{kl}$  being a function of the vectors  $\mathbf{n}_j$  giving the directions of the noise sources; and

· in minimizing the functional  $f$  in such a manner as to determine the directions  $\mathbf{n}_j$  of the noise sources.

2. A method according to claim 1, wherein, in order to minimize the functional  $f$ , the method consists in:

· calculating the Fourier transforms of the signals  $s_i(t)$  delivered by the sensors;

· formally calculating the coefficients  $R_{ij}$ :

$$R_{ij} = \frac{\int_{-\infty}^{+\infty} |\hat{S}_i(\omega)|^2 \cdot |\hat{S}_j(\omega)|^2 d\omega}{\int_{-\infty}^{+\infty} |\hat{S}_i(\omega)|^2 d\omega \cdot \int_{-\infty}^{+\infty} |\hat{S}_j(\omega)|^2 d\omega}$$

· and minimizing the functional  $f$  in order to determine the directions  $\mathbf{n}_j$  of the selected noise sources.

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3. A detection method according to claim 1, wherein, in order to minimize the functional  $f$ , the method consists:

· in formally calculating the correlation coefficient  $R_{ij}$ :

$$R_{ij} = \frac{\int_{-\infty}^{+\infty} \Gamma_{ij}^2(\tau) d\tau}{\Gamma_{ii}(0) \cdot \Gamma_{jj}(0)}$$

where  $\Gamma_{ij}$  is the cross-correlation function between the signals  $S_i$  and  $S_j$ .

- 5    4. A detection method according to claim 1, wherein, after performing the minimization operation, the method consists in calculating the source vector:

$$S(w) = (t^* T^* T)^{-1} \cdot t^* T^* \cdot s(w)$$

- 10    in order to find the characteristics of the noise sources.